Introduction

Fish community surveys are conducted by the South Dakota Department of Game, Fish and Parks (SDGFP) to monitor fish populations throughout Region IV, which is comprised of 13 counties in northeastern South Dakota. Information presented in the following reports provides the results of the most recent fish community surveys(Federal Aid Project # 2102) conducted and includes detailed management objectives that fulfill the requirements for management plans (Federal Aid Project # 2104).

Methods

Frame nets (FN) and gill nets (GN) were generally set over one to three days to survey fish populations. The total number of nets utilized to sample any given lake is dependent on lake size (e.g., surface area). Nets were fished for approximately 24-hour periods and reset at different locations in an attempt to cover as much shoreline and interior lake area as possible; GPS coordinates have been established for each net site and net locations are repeated each survey year. Standard frame nets had 0.9 x 1.5-m (3.0 x 5.0 ft) frames, 0.9-m (3.0 ft) diameter hoops, a single throat, 0.9 x 15.2-m (3.0 x 50.0 ft) lead, and were constructed of 19-mm (0.75 in) knotted mesh. Monofilament gill nets were 1.8 x 45.8 m (6.0 x 150.0 ft) with six sequentially ordered 7.6-m (25.0 ft) panels of 13-mm (0.50 in), 19-mm (0.75 in), 25-mm (1.00 in), 32-mm (1.25 in), 38-mm (1.50 in) and 51-mm (2.00 in) bar-mesh.

Specialized sampling was conducted for largemouth bass, muskellunge, smallmouth bass, and age-0 walleye in select waters. Muskellunge were targeted using large frame nets constructed with 19-mm (0.75 in) knotless mesh, 1.5 x 1.8-m (5.0 x 6.0 ft) frames, 1.5-m (5.0 ft) diameter hoops, a double throat, and a 1.5 x 30.5-m (5.0 x 100.0 ft) lead. Spring electrofishing was conducted to assess largemouth bass (EF-LMB; night electrofishing) and smallmouth bass populations (EF-SMB; included both day and night samples in 2014); fall-night electrofishing was conducted to assess age-0 walleye production (EF-WAE). Electrofishing runs are mapped and standardized at each lake.

Collected fish were measured for total length (TL; mm) and weighed (g). When applicable, a sub-sample of a minimum of 100 fish of each species was measured for TL (mm) and weighed (g). Fish in excess of the 100 fish sub-sample were counted and assigned to 10-mm length groups based on the distribution of fish within the sub-sample. Catch per unit effort (CPUE; gill and frame nets= catch/net-night, electrofishing= catch/hour) of stock-length fish, size structure indices [e.g., proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P)], and relative weight (Wr) were calculated using WinFin Analysis Version 2.3 (Francis 2003).

Scale samples were collected from five fish per 10-mm length group for largemouth bass, smallmouth bass and age-0 walleye. Scale samples were collected from the left side, at the tip of the pectoral fin, and below the lateral line. Collected scales were pressed onto acetate slides using a roller press (Ann Arbor # 10; WILDCO Model 110-H10) and viewed using microfiche (Micron; Model 780).

Otoliths were removed from five fish per 10-mm length group for bluegill, black crappie, walleye, white bass, and yellow perch at select lakes. Typically, otoliths from young fish (i.e., < age 5) were placed in a black-bottomed dish, submerged in water and

viewed whole; while otoliths from older individuals (i.e.,> age 5) were cracked through the focus, lightly toasted with an open flame, placed on end in clay, coated in mineral oil, and viewed using a dissecting microscope (Leica; Model S6D or Nikon; Model C-DS). Age estimates were obtained from collected scale and otolith samples and weighted mean TL at capture values were calculated using Winfin Analysis Version 2.3 (Francis 2003).

Where available, the South Dakota Water Management Board established Ordinary High Water Mark (OHWM) and outlet elevation are reported for individual lakes. Additionally, spring and fall water elevations (feet mean sea level; fmsl) are provided (SDDENR 2015).

Common names, scientific names and abbreviations of fish species mentioned in the following reports.

Common Name	Scientific Name	Abbreviation
Fish Species		
Bigmouth buffalo	*Ictiobus cyprinellus*	BIB
Black bullhead	*Ameiurus melas*	BLB
Black crappie	*Pomoxis nigromaculatus*	BLC
Bluegill	*Lepomis macrochirus*	BLG
Channel catfish	*Ictalurus punctatus*	CCF
Common carp	*Cyprinus carpio*	COC
Common shiner	*Luxilus cornutus*	CNS
Emerald shiner	*Notropis atherinoides*	EMS
Freshwater drum	*Aplodinotus grunniens*	FRD
Golden shiner	*Notemigonus crysoleucas*	GOS
Green sunfish	*Lepomis cyanellus*	GSF
Lake herring	*Coregonus artedi*	LAH
Largemouth bass	*Micropterus salmoides*	LMB
Muskellunge	*Esox masquinongy*	MUE
Northern pike	*Esox lucius*	NOP
Orangespotted sunfish	*Lepomis humilis*	OSF
Pumpkinseed	*Lepomis gibbosus*	PUS
River carpsucker	*Carpiodes carpio*	RCS
Rock bass	*Ambloplites rupestris*	ROB
Rudd	*Scardinius erythophthalmus*	RUD
Saugeye	*Sander vitreusXSander canadensis*	SXW
Shortnose gar	*Lepisosteus platostomus*	SHG
Shorthead redhorse	*Moxostoma macrolepidotum*	SHR
Smallmouth bass	*Micropterus dolomieu*	SMB
Spottail shiner	*Notropis hudsonius*	SPS
Stonecat	*Noturus flavus*	STC
Tadpole madtom	*Noturus gyrinus*	TAM
Walleye	*Sander vitreus*	WAE
White bass	*Morone chrysops*	WHB
White crappie	*Pomoxis annularis*	WHC
White sucker	*Catostomus commersoni*	WHS
Yellow bullhead	*Ameiurus natalis*	YEB
Yellow perch	*Perca flavescens*	YEP

A brief explanation of catch per unit effort (CPUE), population size structure indices [e.g., proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish] and relative weight (Wr).

Catch per unit effort (CPUE) refers to the number of fish captured per a defined unit of effort (i.e., number of fish captured per net-night or number of fish captured per hour electrofishing).

Catch per unit effort (CPUE) =

$$\frac{\text{Number of fish}}{\text{Defined unit of effort}}$$

Population size structure indices **[e.g., proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish; Guy et al. 2007]** are utilized to quantify length-frequency data.

Proportional size distribution of quality-length fish (PSD) =

$$\frac{\text{Number of fish} \geq \text{quality-length}}{\text{Number of fish} \geq \text{stock-length}} \times 100$$

The objective range for PSD values is typically 30-60, and indicates a fish population comprised of an acceptable mix of all fish lengths. Values below the objective range indicate a population dominated by smaller fish; while values above the objective range indicate a population dominated by larger fish.

Proportional size distribution of preferred-length fish (PSD-P) =

$$\frac{\text{Number of fish} \geq \text{preferred-length}}{\text{Number of fish} \geq \text{stock-length}} \times 100$$

The objective range for PSD-P values is typically 5-10. Values less than the objective range indicate a smaller than desired proportion of preferred-length fish in the population; while values greater than the objective indicate a population with a higher than desired proportion of preferred-length fish.

Relative weight (Wr; Wege and Anderson 1978) is an index utilized to gauge the general condition of the fish (i.e., how much does a fish weigh for its length). Relative weight values of 95-105 are commonly cited optimum values. However, Wr values as low as 80 are commonly viewed as acceptable in freshwater fisheries management.

Relative Weight (Wr)=

$$\frac{\text{W (weight of fish)}}{\text{Ws (standard weight)}} \times 100$$

Length categories that have been proposed for fish species mentioned in the following reports. Measurements are minimum total lengths for each category and are reported in centimeters (cm) and inches (in).

	Length Categories										
	Stock		Quality		Preferred		Memorable		Trophy		
Species	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	Source
Bigmouth buffalo	11	28	18	46	24	61	30	76	37	94	Bister et al. 2000
Black bullhead	6	15	9	23	12	30	15	38	18	46	Gabelhouse 1984
Black crappie	5	13	8	20	10	25	12	30	15	38	Gabelhouse 1984
Bluegill	3	8	6	15	8	20	10	25	12	30	Gabelhouse 1984
Channel catfish	11	28	16	41	24	61	28	71	36	91	Gabelhouse 1984
Common carp	11	28	16	41	21	53	26	66	33	84	Gabelhouse 1984
Freshwater drum	8	20	12	30	15	38	20	51	25	63	Gabelhouse 1984
Green sunfish	3	8	6	15	8	20	10	25	12	30	Gabelhouse 1984
Lake herring	5	13	8	20	11	28	14	35	17	43	Fisher and Fielder 1998
Largemouth bass	8	20	12	30	15	38	20	51	25	63	Gabelhouse 1984
Muskellunge	20	51	30	76	38	97	42	107	50	127	Gabelhouse 1984
Northern pike	14	35	21	53	28	71	34	86	44	112	Gabelhouse 1984
Pumpkinseed	3	8	6	15	8	20	10	25	12	30	Gabelhouse 1984
Rock bass	4	10	7	18	9	23	11	28	13	33	Gabelhouse 1984
Rudd	6	15	10	25	12	30	15	38	19	48	Blackwell et al. 2009
Shorthead redhorse	6	15	10	25	13	33	16	41	20	51	Bister et al. 2000
Smallmouth bass	7	18	11	28	14	35	17	43	20	51	Gabelhouse 1984
Walleye	10	25	15	38	20	51	25	63	30	76	Gabelhouse 1984
White bass	6	15	9	23	12	30	15	38	18	46	Gabelhouse 1984
White crappie	5	13	8	20	10	25	12	30	15	38	Gabelhouse 1984
White sucker	6	15	10	25	13	33	16	41	20	51	Bister et al. 2000
Yellow bullhead	4	10	7	18	9	23	11	28	14	36	Bister et al. 2000
Yellow perch	5	13	8	20	10	25	12	30	15	38	Gabelhouse 1984

Standard weight (Ws) equations used in the calculation of relative weight (Wr) for fish species mentioned in the following reports.

	Ws Equation			
Species	Intercept	Slope	Minimum TL	Source
Bigmouth buffalo	-5.07	3.12	150	Bister et al. 2000
Black bullhead	-4.97	3.09	130	Bister et al. 2000
Black crappie	-5.62	3.35	100	Neumann and Murphy 1991
Bluegill	-5.37	3.32	80	Hillman 1982
Channel catfish	-5.80	3.29	70	Brown et al. 1995
Common carp	-4.64	2.92	200	Bister et al. 2000
Freshwater drum	-5.42	3.20	100	Blackwell et al. 1995
Golden shiner	-5.59	3.30	50	Liao et al. 1995
Green sunfish	-4.91	3.10	60	Bister et al. 2000
Lake herring	-5.52	3.22	100	Fisher and Fielder 1998
Largemouth bass	-5.53	3.27	150	Henson 1991
Muskellunge	-6.07	3.33	380	Nuemann and Willis 1994
Northern pike	-5.44	3.10	100	Anderson and Nuemann 1996
Pumpkinseed	-5.18	3.24	50	Liao et al. 1995
River carpsucker	-4.84	2.99	130	Bister et al. 2000
Rock bass	-4.83	3.07	80	Bister et al. 2000
Saugeye	-5.69	3.27	100	Flammang et al. 1993
Shorthead Redhorse	-4.84	2.96	100	Bister et al. 2000
Smallmouth bass	-5.33	3.20	150	Kolander et al. 1993
Walleye	-5.45	3.18	150	Murphy et al. 1990
White bass	-5.07	3.08	115	Brown and Murphy 1991
White crappie	-5.64	3.33	100	Neumann and Murphy 1991
White sucker	-4.76	2.94	100	Bister et al. 2000
Yellow bullhead	-5.37	3.23	60	Bister et al. 2000
Yellow perch	-5.39	3.23	100	Willis et al. 1991